Listing of All Claims Including Current Amendments

1. (currently amended) A link assembly for a robot arm which assembly comprises:

a first set of first and second link members each adapted for limited movement one with respect to the other, said first link member having a first set opening extending therethrough;

a resilient elastomer disposed between said first set of first and second members;

a second set of third and fourth link members each adapted for limited movement one with respect to the other, said fourth link member having a second set opening extending therethrough;

a resilient elastomer disposed between said second set of third and fourth members, where the second member abuts the third member;

at least one wire extending through said first set opening in ~~from~~ said first set of link members and through said second set opening in ~~to~~ said second set of link members controlling the movement of said first and second set of link members, wherein said first set opening and said second set opening comprise fluted openings;

said at least one wire including a preload so as to maintain said link assembly under compression;

characterized in that the first and second link members are configured in a cooperating mating relationship and the elastomer is disposed between them as a layer and the elastomer is keyed or bonded to both of the first and second link members whereby the layer is maintained under compression by said at least one wire such that a bending movement between the members produces shear movement within the elastomer and substantially no compressive movement as a result of the relative movement between the said first and said second members.

2. (original) A link assembly as claimed in claim 1 wherein the elastomer is a natural

or synthetic rubber.

3. (cancelled)

4. (previously presented) A link assembly as claimed in claim 1 wherein the thickness of the layer is 3 mm or less.

5. (cancelled)

6. (previously presented) A link assembly as claimed in claim 1 wherein each surface of the elastomeric layer contiguous the member is secured so that in operation, relative movement between the members produces shear movement within the elastomer, the arrangement being such that the thinness of the layer reduces the tendency towards compression thereby imparting improved stability for the positioning of the components.

7. (previously presented) A link assembly as claimed in claim 1 wherein the elastomer means comprises a plurality of layers of elastomer.

8. (previously presented) A link assembly as claimed in claim 7 wherein an interleaving rigid layer is bonded or keyed to adjacent elastomer layers to separate one layer from its neighbor.

9. (previously presented) A link assembly as claimed in claim 1 wherein the elastomer means is a laminate.

10. (previously presented) A link assembly as claimed in claim 8 wherein the interleaving layer between each layer of elastomer is of a material, which is bondable to or capable of being keyed to the elastomer.

11. (cancelled)

12. (previously presented) An assembly as claimed in claim 8 wherein the interleaving layer comprises a metal layer, a resin or glass fiber, or a mat of either woven or unwoven material.

13. (previously presented) An assembly as claimed in claim 12 wherein the woven or unwoven material comprises carbon fiber or Kevlar.

14. (cancelled)

15. (previously presented) A robotic arm comprising a segment having a plurality of link assemblies as claimed in claim 1 and said at least one wire comprises control means for controlling the movement of said link assemblies within the segment.

16. (cancelled)

17. (previously presented) A robotic arm as claimed in claim 15 wherein the control means comprises three wires each extending from one end of the segment to the other whereby changing the tension in the wires one relative to the other causes or allows the links to flex thereby controlling movement of the segment.

18. (previously presented) A robotic arm as claimed in claim 17 wherein the wires are tensioned to maintain the links under compression, the arrangement being such that application of differential tension between the wires causes or allows the segment to move or bend.

19. (previously presented) A robotic arm as claimed in claim 15 wherein, in each link

assembly, the first link member comprises an outer disc having holes for control wires so that the control wires extend externally of the other components of the link assembly, and the second link member comprises an inner disc which is adapted to be disposed generally inwardly of the outer disc and which has a central bore to accommodate at least one of control and power means for the work head and a rubber disc or layer extending between each inner and outer disc which is bonded or keyed to each, but which is otherwise free-floating between said inner disc and outer disc so that the inner disc is not directly constrained by other components of the assembly.

20. (previously presented) A robotic arm as claimed in claim 15 comprising a plurality of said segments in which control means is provided for each segment.

21. (original) A robotic arm as claimed in claim 20 wherein each segment terminates in an end cap having wire conduit means for the control wires of other segments of the arm and anchorage means arcuately spaced about the cap for securing the control wires for the segment in question.

22. (previously presented) A robotic arm as claimed in claim 15 wherein at least one of the members of each link is provided with means for guiding the wires from one end of the segment to the other.

23. (previously presented) A robotic arm as claimed in claim 15 wherein each wire is disposed externally of the segment links and terminates in a ferrule which is adapted to engage with a corresponding recess in the end cap of a segment so that on tensioning the wires, the ferrule is brought into engagement with the end cap to exert a compressive load on each of the links to maintain the stiffness of the links within the segment.

24. (previously presented) A robotic arm as claimed in claim 20 characterized in that

each control wire is operated by an actuator and wherein the actuators associated with each control wire are spaced in one or more arcs about a headboard contiguous one end of the first segment.

25. (previously presented) A robotic arm as claimed in claim 24 wherein the actuator array provides one actuator for each wire to be disposed in a spaced arcuate relationship to define a frustocone, further characterized in that the wire from at least one actuator is passed about a guide or pulley to provide a fair lead for the control wire from the actuator to the entry into the segment.

26. (previously presented) An assembly as claimed in claim 1 wherein each link is produced as a pair of half links which permit back to back assembly, the arrangement being such that an inner link and an outer link halves may be assembled with its associated bonding layer to form unitary link components, a plurality of which together can be assembled to form a segment.

27. (cancelled)

28. (previously presented) An assembly or arm as claimed in claim 26 wherein each of the half links can be located by means of locating dowels provided in mating holes on each of the assembled half-links whereby the assembly can be produced without further connection between the half-linked components and cables can be threaded through the various operating holes in the outer link periphery coupled to the actuator board, the arrangement being such that the actuators can be activated to produce a degree of tension in the board and in the cables whereby the whole assembly is held together so that by varying the tension in the wires, the segment can be manipulated as appropriate.

29. (previously presented) An arm as claimed in claim 15 characterized by an

external sleeve provided about each segment.

30. (previously presented) An arm as claimed in claim 29 wherein the sleeve is a bellows-type sheath.

31. (previously presented) An arm as claimed in claim 29 wherein the sleeve comprises a material and a configuration which are selected to increase the tortional stiffness of the arm.

32. (previously presented) An arm as claimed in claim 29 wherein the sheathed segment is filled with a lubricant.

33. (previously presented) An arm as claimed in claim 32 wherein the lubricant is either a dry powder or a liquid such as grease and/or oil and wherein the physical characteristics of the lubricant incorporated in the arm are selected according to the environment in which the arm is to operate.

34. – 36. (cancelled)

37. (currently amended) A link assembly for a robot arm which assembly comprises:

a first set of link members including:

a first member <u>having a first set opening extending therethrough</u>;

a second member adjacent to said first member, said second member comprising an elastomer;

a third member adjacent to said second member;

said first and said third members adapted for movement with respect to each other;

a second set of link members including:

a fourth member;

a fifth member adjacent to said fourth member, said fifth member comprising an elastomer;

a sixth member adjacent to said fifth member having a second set opening extending therethrough;

said fourth and said sixth members adapted for movement with respect to each other;

said first set of link members positioned adjacent to said second set of link members;

wherein said first set opening and said second set opening comprise fluted openings;

at least one wire extending from said first member to said sixth member controlling the movement of said first and second set of link members, said at least one wire including a preload so as to maintain said link assembly under compression;

wherein the first and third members are configured in a cooperating mating relationship and the second member is disposed between them as a layer maintained under compression by said at least one wire such that a bending movement between the first and third members produces shear movement within the second member and substantially no compressive movement as a result of the relative movement between the first and third members; and

wherein the fourth and sixth members are configured in a cooperating mating relationship and the fifth member is disposed between them as a layer maintained under compression by said at least one wire such that a bending movement between the fourth and sixth members produces shear movement within the fifth member and substantially no compressive movement as a result of the relative movement between the fourth and sixth members.

38. (new) An arm as claimed in claim 1 wherein said second link member abuts said third link member.

39. (new) An arm as claimed in claim 38 further comprising a third set of link members including a fifth and a six link member, each adapted for limited movement one with respect to the other, said fifth link member having a third set opening extending therethrough;

wherein said third set opening comprises a fluted opening; and

a resilient elastomer disposed between said third set of fifth and sixth link members.

40. (new) An arm as claimed in claim 39 wherein said fifth link member abuts said fourth link member such that said second set opening abuts said third set opening.

41. (new) An arm as claimed in claim 40 wherein said second set opening is fluted such that an inner diameter of said second set opening is larger at an end extending away from said fifth member.

42. (new) An arm as claimed in claim 41 wherein said third set opening is fluted such that an inner diameter of said third set opening is larger at an end extending away from said fourth member.

43. (new) An arm as claimed in claim 1 wherein said fluted first set opening and said fluted second set opening are provided with a diameter such that said wire extends in close tolerance through said openings.

44. (new) An arm as claimed in claim 1 wherein said first and second link members and said third and fourth link members include a central bore extending therethrough.

45. (new) An arm as claimed in claim 37 wherein said third member abuts said fourth member.

46. (new) An arm as claimed in claim 45 further comprising a third set of link members including:

a seventh member having an third set opening extending therethrough;

an eighth member adjacent to said seventh member, said eighth member comprising an elastomer;

a ninth member adjacent to said eighth;

said seventh and said ninth members adapted for movement with respect to each other.

47. (new) An arm as claimed in claim 46 wherein said seventh member abuts said sixth member such that said second set opening abuts said third set opening.

48. (new) An arm as claimed in claim 47 wherein said second set opening is fluted such that an inner diameter of said second set opening is larger at an end extending away from said seventh member.

49. (new) An arm as claimed in claim 48 wherein said third set opening is fluted such that an inner diameter of said third set opening is larger at an end extending away from said sixth member.

50. (new) An arm as claimed in claim 37 wherein said fluted first set opening and said fluted second set opening are provided with a diameter such that said wire extends in close tolerance through said openings.

51. (new) An arm as claimed in claim 37 wherein said first and third members and said fourth and sixth members include a central bore extending therethrough.